

WHAT IS CLAIMED IS:

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1. A DC-DC converter having a main switch and a synchronous rectifying switch, in which said main switch and said synchronous rectifying switch are alternately turned on so that a voltage of a DC electric power is transformed and outputted, said DC-DC converter comprises:

10 a detection circuit for detecting a state that said main switch and said synchronous rectifying switch are simultaneously turned on.

~~2. A DC-DC converter according to claim 1, wherein said DC-DC converter further comprises a display unit for displaying that said main switch and said synchronous rectifying switch are simultaneously turned on.~~

15 3. A DC-DC converter according to claim 1, wherein said DC-DC converter further comprises an operation stop circuit for stopping a conversion operation of said DC-DC converter in a case where said main switch and said synchronous rectifying switch are simultaneously turned on.

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4. A DC-DC converter according to claim 1, wherein said detection circuit monitors at least one of said main switch and said synchronous rectifying switch.

25 5. A DC-DC converter according to claim 1, wherein said detection circuit monitors a direction of a current conducting through said synchronous rectifying switch to detect a state that said main switch and said synchronous rectifying switch are simultaneously turned on.

5 6. A DC-DC converter according to claim 1,
wherein said detection circuit monitors a magnitude of a
current conducting through said main switch to detect a
state that said main switch and said synchronous rectifying
switch are simultaneously turned on.

10 7. A DC-DC converter according to claim 1,
wherein said detection circuit monitors a driving signal
driving said main switch and said synchronous rectifying
switch to detect a state that said main switch and said
synchronous rectifying switch are simultaneously turned on.

15 8. A DC-DC converter control circuit, in which a
main switch and a synchronous rectifying switch are
alternately turned on so that a voltage of a DC electric
power is transformed and outputted, said DC-DC converter
control circuit comprises:

a detection circuit for detecting a state that
said main switch and said synchronous rectifying switch are
simultaneously turned on.

20 9. A DC-DC converter control circuit according to
claim 8, wherein said DC-DC converter control circuit
further comprises detection result output means for
outputting a detection result of said detection circuit.

25 10. A DC-DC converter control circuit according
to claim 8, wherein said DC-DC converter control circuit
further comprises an operation stop circuit for stopping a
conversion operation of said DC-DC converter in a case
where said main switch and said synchronous rectifying

switch are simultaneously turned on.

11. A DC-DC converter control circuit according to claim 8, wherein said detection circuit monitors at least one of said main switch and said synchronous rectifying switch.

12. A DC-DC converter control circuit according to claim 8, wherein said detection circuit monitors a direction of a current conducting through said synchronous rectifying switch to detect a state that said main switch and said synchronous rectifying switch are simultaneously turned on.

13. A DC-DC converter control circuit according to claim 8, wherein said detection circuit monitors a magnitude of a current conducting through said main switch to detect a state that said main switch and said synchronous rectifying switch are simultaneously turned on.

14. A DC-DC converter control circuit according to claim 8, wherein said detection circuit monitors a driving signal driving said main switch and said synchronous rectifying switch to detect a state that said main switch and said synchronous rectifying switch are simultaneously turned on.

15. A monitor circuit for a DC-DC converter control circuit, in which a main switch and a synchronous rectifying switch are alternately turned on so that a voltage of a DC electric power is transformed and outputted, said monitor circuit comprises:

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a detection circuit for detecting a state that
said main switch and said synchronous rectifying switch are
simultaneously turned on.

16. A monitor circuit according to claim 15,
5 wherein said monitor circuit further comprises detection
result output means for outputting a detection result of
said detection circuit.

17. A monitor circuit according to claim 15,
wherein said monitor circuit further comprises an operation
10 stop circuit for stopping a conversion operation of said
DC-DC converter in a case where said main switch and said
synchronous rectifying switch are simultaneously turned on.

18. A monitor circuit according to claim 15,
wherein said detection circuit monitors at least one of
15 said main switch and said synchronous rectifying switch.

19. A monitor circuit according to claim 15,
wherein said detection circuit monitors a direction of a
current conducting through said synchronous rectifying
switch to detect a state that said main switch and said
20 synchronous rectifying switch are simultaneously turned on.

20. A monitor circuit according to claim 15,
wherein said detection circuit monitors a magnitude of a
current conducting through said main switch to detect a
state that said main switch and said synchronous rectifying
25 switch are simultaneously turned on.

21. A monitor circuit according to claim 15,
wherein said detection circuit monitors a driving signal

driving said main switch and said synchronous rectifying switch to detect a state that said main switch and said synchronous rectifying switch are simultaneously turned on.

22. An electronic equipment comprising:

5 a DC-DC converter having a main switch and a synchronous rectifying switch, in which said main switch and said synchronous rectifying switch are alternately turned on so that a voltage of a DC electric power is transformed and outputted; and

10 a detection circuit for detecting a state that said main switch and said synchronous rectifying switch are simultaneously turned on,

wherein said electronic equipment is operative with an electronic power from said DC-DC converter.

15 23. An electronic equipment according to claim 22, wherein said electronic equipment further comprises a display unit for displaying that said main switch and said synchronous rectifying switch are simultaneously turned on.

20 24. An electronic equipment according to claim 22, wherein said electronic equipment further comprises an operation stop circuit for stopping a conversion operation of said DC-DC converter in a case where said main switch and said synchronous rectifying switch are simultaneously turned on.

25 25. An electronic equipment according to claim 22, wherein said detection circuit monitors at least one of said main switch and said synchronous rectifying switch.

26. An electronic equipment according to claim 22,
wherein said detection circuit monitors a direction of a
current conducting through said synchronous rectifying
switch to detect a state that said main switch and said
synchronous rectifying switch are simultaneously turned on.

27. An electronic equipment according to claim 22,
wherein said detection circuit monitors a magnitude of a
current conducting through said main switch to detect a
state that said main switch and said synchronous rectifying
switch are simultaneously turned on.

28. An electronic equipment according to claim 22,
wherein said detection circuit monitors a driving signal
driving said main switch and said synchronous rectifying
switch to detect a state that said main switch and said
synchronous rectifying switch are simultaneously turned on.

29. A method of monitoring a DC-DC converter
having a main switch and a synchronous rectifying switch,
wherein said main switch and said synchronous
rectifying switch are alternately turned on so that a
voltage of a DC electric power is transformed and outputted,
and

a state that said main switch and said synchronous
rectifying switch are simultaneously turned on is detected.

30. A method of monitoring a DC-DC converter
according to claim 29, wherein it is displayed in
accordance with said detection that said main switch and
said synchronous rectifying switch are simultaneously

turned on.

31. A method of monitoring a DC-DC converter according to claim 29, wherein a conversion operation of said DC-DC converter is stopped in accordance with said detection.

32. A method of monitoring a DC-DC converter according to claim 29, wherein said detection monitors at least one of said main switch and said synchronous rectifying switch.

33. A method of monitoring a DC-DC converter according to claim 29, wherein said detection monitors a direction of a current conducting through said synchronous rectifying switch to detect a state that said main switch and said synchronous rectifying switch are simultaneously turned on.

34. A method of monitoring a DC-DC converter according to claim 29, wherein said detection monitors a magnitude of a current conducting through said main switch to detect a state that said main switch and said synchronous rectifying switch are simultaneously turned on.

35. A method of monitoring a DC-DC converter according to claim 29, wherein said detection monitors a driving signal driving said main switch and said synchronous rectifying switch to detect a state that said main switch and said synchronous rectifying switch are simultaneously turned on.

36. A DC-DC converter having a first switch and

an inductor which are connected in series, and a second switch disposed between a connecting point of said first switch with said inductor and a ground point, in which said first switch and said second switch are alternately turned on so that a voltage of a DC electric power is transformed and outputted, said DC-DC converter comprises:

a detection circuit for detecting a state that said first switch and said second switch are simultaneously turned on.

37. A DC-DC converter control circuit, in which a first switch connected in series to an inductor and a second switch disposed between a connecting point of said first switch with said inductor and a ground point are alternately turned on so that a voltage of a DC electric power is transformed and outputted, said DC-DC converter control circuit comprises:

a detection circuit for detecting a state that said first switch and said second switch are simultaneously turned on.

38. A monitor circuit for a DC-DC converter control circuit, in which a first switch connected in series to an inductor and a second switch disposed between a connecting point of said first switch with said inductor and a ground point are alternately turned on so that a voltage of a DC electric power is transformed and outputted, said monitor circuit comprises:

a detection circuit for detecting a state that

said first switch and said second switch are simultaneously turned on.

39. An electronic equipment comprising:

5 a DC-DC converter having a first switch and an inductor which are connected in series, and a second switch disposed between a connecting point of said first switch with said inductor and a ground point, in which said first switch and said second switch are alternately turned on so that a voltage of a DC electric power is transformed and
10 outputted; and

a detection circuit for detecting a state that said first switch and said second switch are simultaneously turned on,

15 wherein said electronic equipment is operative with an electronic power from said DC-DC converter.

40. A method of monitoring a DC-DC converter having a first switch and an inductor which are connected in series, and a second switch disposed between a connecting point of said first switch with said inductor
20 and a ground point,

wherein said first switch and said second switch are alternately turned on so that a voltage of a DC electric power is transformed and outputted, and

25 a state that said first switch and said second switch are simultaneously turned on is detected.